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(54) **DRUG DELIVERY DEVICE**

(75) Inventors: **Richard A. Cronenberg**, Mahwah, NJ (US); **Lionel Vedrine**, Palo Alto, CA (US); **Paul Alchas**, Franklin Lakes, NJ (US)

(73) Assignee: **Becton, Dickinson and Company**, Franklin Lakes, NJ (US)

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(58) **Field of Classification Search**

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,858,001 A * 1/1999 Tsals et al. 604/135

5,957,895 A 9/1999 Sage et al.

6,595,956 B1 7/2003 Gross et al.

(Continued)

FOREIGN PATENT DOCUMENTS

EP 1 064 035 B1 11/2003

JP 11-313889 11/1999

(Continued)

Primary Examiner — Bradley Osinski

(74) *Attorney, Agent, or Firm* — Dickinson Wright PLLC

(57) **ABSTRACT**

The subject invention provides a drug delivery device for injecting medicament which includes: a tubular reservoir; a stopper slidably disposed in the reservoir; a spring for moving the stopper in the reservoir; at least one needle, the needle having a distal end for insertion into a patient, and a lumen extending proximally from the distal end, the lumen being in direct or indirect communication with the reservoir; a needle driver for displacing the needle; and, an actuator. Activation of the actuator causes the spring to move the stopper and the needle driver to displace the needle. The needle moves relative to, and separately from, the reservoir with the needle being displaced. Advantageously, with the subject invention, a drug delivery device is provided wherein a needle is moved, relative to the reservoir, in being displaced for injection. This permits control of the needle displacement separate from the reservoir.

19 Claims, 23 Drawing Sheets

